FACT SHEET

United States Environmental Protection Agency
Region 10
Park Place Building, 13th Floor
1200 Sixth Avenue, OW-130
Seattle, Washington 98101
(206) 553-1214

Permit No.: AK-004064-9 Date: June 25, 1998

PROPOSED REISSUANCE OF A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE POLLUTANTS PURSUANT TO THE PROVISIONS OF THE CLEAN WATER ACT (CWA) OF 1987.

Cominco Alaska, Incorporated
(Red Dog Port Site)

has applied for reissuance of a NPDES permit to discharge pollutants pursuant to the provisions of the CWA. This Fact Sheet includes (a) the tentative determination of the Environmental Protection Agency (EPA) to reissue the permit, (b) information on public comment, public hearing and appeal procedures, (c) the description of the current discharge and current and future sewage sludge practices, (d) a listing of tentative effluent limitations, monitoring requirements and other conditions, and (e) a detailed description and map of the facility and discharge locations. We call your special attention to the technical material presented in the latter part of this document.

Persons wishing to comment on the tentative determinations contained in the draft permit may do so by the expiration date of the Public Notice. All written comments should be submitted to the EPA as described in the Public Comments Section of the attached Public Notice.

After the expiration date of the Public Notice, the Office of Water Director will make final determinations with respect to the permit reissuance. The tentative determinations contained in the draft permit will become final conditions if no substantive comments are received during the Public Notice period.

The permit will become effective 30 days after the final determinations are made, unless a request for an evidentiary hearing is submitted within 30 days after receipt of the final determinations.

The draft NPDES permit, and other related documents, are on file and may be inspected at the above address any time between 8:30 a.m. and 4:00 p.m., Monday through Friday. Copies and other information may be requested by writing to the EPA at the above address to the attention of the NPDES Permits Unit, or by calling (206) 553-1214. This material is also available from the EPA Alaska Operations Office (Federal Building Room 537, 222 W. 7th Avenue, Suite #19, Anchorage, Alaska 99513) or the Alaska Department of Environmental Conservation in Fairbanks

(610 University Avenue, Fairbanks, Alaska 99709-3643).

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APPENDICES

LIST OF ACRONYMS

ADEC	Alaska Department of Environmental Conservation
AML	Average Monthly Limit
AWL	Average Weekly Limit
BMP	Best Management Practices
BOD	Biochemical Oxygen Demand
CFR	Code of Federal Regulations
CSB	Concentrate Storage Building
CV	Coefficient of Variation
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DMR	Discharge Monitoring Report
ELG	Effluent Limitation Guidelines
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FC	Fecal Coliform
gpm	gallons per minute
gpd	gallons per day
MDL	Method Detection Level
mgd	millions of gallons per day
ML	Minimum Level
MPN	Most Probable Number
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
PAC	Personnel Accomodations Complex
ppt	parts per thousand
QAP	Quality Assurance Plan
RWC	Receiving Water Concentration
STP	Sewage Treatment Plant
s.u.	standard units
TSD	Technical Support Document (EPA 1991)
TSS	Total Suspended Solids
USF&WS	United States Fish and Wildlife Service
WET	Whole Effluent Toxicity
WLA	Waste Load Allocation
WQBEL	Water Quality-based Effluent Limitations

I. APPLICANT

Cominco Alaska Incorporated
(Red Dog Port Site)

Mailing Address:
P.O. Box 1230
Kotzebue, Alaska 99752

Facility Location:
Northwest section of Cape Krusenstern National Monument (Northwest Arctic Borough)

Contact: Jim Kulas, Manager Environmental Affairs
NPDES Permit No.: AK-004064-9

II. ACTIVITY

The Port Site supporting the Red Dog Mine (hereafter referred to as "Port Site") is located on the shore of the Chukchi Sea, approximately 17 miles southeast of Kivalina, Alaska. The Red Dog mining operation is a joint venture of Cominco Alaska, Inc. (Cominco), and the NANA Regional Corporation. The Port Site discharge is located at approximately 67º 34' N latitude and 164º 03' W longitude. The shipping of zinc and lead concentrate from the Red Dog Mine onto the Foss Maritime self-unloading shallow draft barges occurs at the Port Site. The Red Dog Mine (Mine) and Port Site are connected by 52 miles of Delong Mountain Regional Transportation System Road (See A). The draft permit only covers the Port Site and Delong Mountain Regional Transportation System Road. Cominco predicts that the Mine and Port Site will be operational for an additional 50 years.

III. RECEIVING WATER

The effluent from the sewage treatment plant facilities (personnel accommodations complex and temporary construction camp) and the desalination plant are presently discharged into a freshwater lagoon and 12 foot deep infiltration will. The facilities will discharge, via pipeline, directly to the Chukchi Sea upon issuance of the permit. The Chukchi Sea is designated in the State of Alaska Water Quality Standards (1996, 18 AAC 70.020(b)(2)) as protected for water supply; water recreation; growth and propagation of fish, shellfish, other aquatic life, and wildlife; and harvesting for consumption of raw mollusks or other raw aquatic life.

The treated mine drainage from around the two concentrate storage buildings is currently discharged directly to the tundra. The tundra is designated in the State of Alaska Water Quality Standards (1996, 18 AAC 70.020(b)(1)) as protected for water supply; water recreation; and growth and propagation of fish, shellfish, other aquatic life; and wildlife.

Cominco is considering rerouting the treated mine drainage from the tundra to the Chukchi Sea. If rerouted, the outfall will be separate from the sewage treatment plant and desalination plant outfall. The draft permit therefore includes limits for the mine drainage discharge that are protective of both a freshwater (tundra) or marine (Chukchi Sea) discharge.

IV. FACILITY DESCRIPTIONS AND DISCHARGES

A. Port Site Description

The Port Site facility includes a shallow water dock, a laydown area for storage of materials shipped to the Mine, three equipment maintenance and storage buildings, a conveyor from the concentrate storage building to the dock, a fuel pipeline and storage area, a diesel fuel pumphouse, accommodations for the Port Site personnel, accommodations for temporary construction personnel, two sewage treatment plants, two co-incinerators, and two desalination plants (inside the maintenance building). The existing concentrate storage building (CSB) and new zinc CSB are located 3,600 feet inland from the port loadout facilities and are considered part of the Port Site. The Port Site receives supplies and fuel, and ships concentrate only during the summer (open water seasons).

B. Discharge Descriptions

1. Outfall 001: Personnel Accommodations Complex (PAC) Sewage Treatment Plant, Temporary Construction Camp Sewage Treatment Plant, and Desalination Plant

Two Port Site sewage treatment plans (STPs), located at the PAC and the temporary construction camp, discharge domestic sewage and wastewater to the Chukchi Sea through outfall 001. Discharge will be through a submerged port diffuser located below the surface of the Chukchi Sea. Previously these discharges were to the port camp lagoon north of the concentrate conveyor. The STPs provide secondary treatment by extended aeration and biological activation. Each plant process consists of a surge tank, aeration tank, sludge return air lift system, aerobic digester, clarifier and Ultraviolet light disinfection. The STPs are capable of supporting a summer maximum workforce at the PAC and temporary construction camp of 100 people each. At this maximum capacity the flow would be approximately 12,000 gpd per plant. During the winter, each STP supports approximately 15 people with resulting flows from 1,200 to 2,500 gpd.

The temporary construction camp is located 0.5 mile east of the new CSB along the road to the Mine. The treated effluent from the camp is

trucked to the PAC and discharged via Outfall 001. The permit proposes to allow disposal of the created sludge/biosolids from the STPs by co-incineration.

The desalination plants are located in the maintenance building on the northeastern side of the Port Site pad. The plants utilize reverse osmosis to supply the fresh water (potable) needs of the Port Site personnel. There are two saltwater wells located on the beach, north of the dock, that supply saltwater to the desalination plants. The draft permit authorizes the discharge of the backwash brine to outfall 001 to the Chukchi Sea. The average desalination plant discharge is 5,040 gpd during the non-shipping season and 6,500 gpd during shipping seasons. The design capacity of the plant is 40,320 gpd.

2. *Outfall 005:Mine drainage Past the Concentrate Storage Buildings*

Each of the two CSBs are completely enclosed steel-engineered facilities located on five feet thick gravel pads. The CSBs provide storage for zinc and lead concentrates, allowing for an accumulation during the winter months when ocean shipping of concentrates is not possible. Two garage-type door portals, at both ends of the buildings, provide access for equipment to the building. A separate truck unloading building, with garage doors at both ends is used to unload onto an enclosed conveyor system, which transports the concentrates to stockpiles within each building. Before the vehicles exit the CSBs, they are washed down and the dirty water is sent through a separator and recycled for reuse on the next vehicle. Periodically the sludge and dirty water from the washing operation is collected in a sump and transported to the mine for reprocessing. During open-water seasons, concentrates are transported from the CSBs to an offshore loading facility by another enclosed conveyor system.

Drainage ditches have been constructed around the CSBs to divert snowmelt and mine drainage runoff away from the buildings. This mine drainage is then treated, via a settling sump, before discharge to the tundra. The draft permit continues to allow mine drainage discharge to the tundra as well as the option of discharging to the Chukchi Sea through a heat traced pipeline. Cominco has supplied estimated data suggesting that the maximum amount of drainage from around the CSBs is 750 gpm during spring and summer.

3. *Delong Mountain Regional Transportation System Road*

This draft permit covers the storm water runoff from the 52 mile long haul road connecting the mine to the Port Site. Supplies, concentrate, fuel, and mine and port personnel travel along the road on a daily basis. Cominco is the sole user of the road and has a full time crew for maintenance purposes. The road is constructed from local rock and dust is controlled through the addition of calcium chloride, watering, and aggregate base renewal from gravel pits along the route. No additional chemicals are added to the road surface. The road has nine bridges that pass over creeks and numerous culverts to allow seasonal drainage to follow its natural course.

V. BACKGROUND

NPDES Permit No. AK-004064-9 was first issued for the Red Dog Port Site on August 21, 1986. The NPDES permit, by its terms, expired on August 20, 1991. Because Cominco's application for renewal was not signed, EPA could not administratively extend the permit. Cominco did submit updated permit applications on October 1, 1991; September 30, 1992; January 24, 1996; and August 12, 1996. EPA and Cominco entered into a settlement of EPA's claims relating to the numerous violations of pH, 5-day Biochemical Oxygen Demand (BOD_5), Total Suspended Solids (TSS) problems from mid-1990 through mid-1994. The terms of the settlement were incorporated into a Consent Decree entered by the U.S. District Court for Alaska, after public notice, on November 25, 1997. The Consent Decree provided for interim effluent limits based on the 1986 NPDES permit, with those interim effluent limits to expire when the new NPDES permit is issued. Since mid-1994, Cominco has generally been in compliance with the 1986 permit conditions (with only one reported pH violation).

VI. BASIS FOR EFFLUENT LIMITS

A. General Authority

Sections 101, 301(b), 304, 308, 401, 402, and 405 of the Clean Water Act (CWA) provide the basis for the effluent limitations and other conditions in the draft permit. The EPA evaluates discharges with respect to these sections of the CWA, relevant NPDES regulations, and state water quality standards in determining which conditions to include in the permit.

In general, EPA first determines which technology-based limits are required to be incorporated into the permit (40 CFR 122.44(a)). The EPA may find, by analyzing the effect of a discharge on the receiving water, that technology based effluent limits are not sufficiently stringent enough to meet water quality standards. In such cases, EPA regulations at 40 CFR 122.44(d)(1) require the development of

more stringent water quality-based limits designed to ensure that water quality standards are met. The draft permit limits will thus reflect whichever limits (technology-based or water quality-based) are most stringent. The limits which the EPA is proposing in the permit for each parameter are discussed in Section VI.D.

B. Technology-based Limits

The CWA requires particular categories of industrial dischargers to meet technology-based Effluent Limitation Guidelines (ELGs) established by the EPA. The intent of a technology-based effluent limit is to require a minimum level of treatment for industrial point sources based on currently available treatment technologies while allowing the discharger to use any available control technology to meet the limitations. The national ELGs are developed based on demonstrated performance of a reasonable level of treatment that is within the economic means of specific categories of industry.

1. Sewage Treatment Plants

The ELGs for treatment works performing secondary treatment are defined in federal regulation 40 CFR 133.102 as follows:

Parameter	**Monthly Average (mg/L)**	**Weekly Average (mg/L)**	**Percent Removal (%)**
BOD_5	30	45	85
TSS	30	45	85
pH	within the range of 6.0 -9.0		

According to the EPA's best professional judgement (BPJ), these limitations provide the baseline requirements for the sewage treatment plants performing secondary treatment. These limitations are incorporated into the permit as both concentration limits and loading limits. The loadings are determined by multiplying the appropriate concentration in mg/L by the design flow in mgd and a conversion factor of 8.34 (to convert from mg/L and mgd to lb/day).

2. Concentrate Storage Building Mine Drainage

The federal ELGs applicable to the Port Site mine drainage are found in 40 CFR Part 440, Subpart J - Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores Subcategory. Specifically, 40 CFR Part 440.104 - Effluent Limitations, represents the degree of effluent reduction attainable by the application of ELGs. These technology-based limitations for copper, zinc, lead, mercury, cadmium, pH, and TSS are presented in the following table.

Effluent Parameter	**Effluent Limitations**		
	Daily Maximum Limit (mg/L)		**Average Monthly Limit (mg/L)**
Copper	0.30		0.15
Zinc	1.5		0.750
Lead	0.6		0.3
Mercury	0.002		0.001
Cadmium	0.1		0.05
pH	6.0	-	9.0
Total Suspended Solids	30.0		20.0

C. Water Quality-Based Effluent Limits

1. Statutory Authority

Section 301(b)(1)(C) of the CWA requires the establishment of permit limits necessary to meet water quality standards. Discharges to state waters must also comply with limitations imposed by the State as part of its certification of NPDES permits under section 401 of the CWA.

NPDES regulation 40 CFR 122.44(d)(1) requires that permits include limits on all pollutants or parameters which "are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state

narrative criteria for water quality." Regulations require that this evaluation be made using procedures which account for existing controls on point and non-point sources of pollution, the variability of the pollutant in the effluent, species sensitivity (for toxicity), and dilution in the receiving water (where appropriate). The limits must be stringent enough to ensure that water quality standards are met, and must be consistent with any available wasteload allocation.

The regulations also specifically address when toxicity and chemical-specific limits are required. These limits are required whenever the discharge has the reasonable potential to cause or contribute to an excursion above either a numeric or narrative standard for toxicity. Toxicity limits are not required when chemical-specific limits can fully achieve the narrative toxicity standard.

The sections below provide a detailed discussion of the steps involved in developing water quality-based effluent limits (WQBEL).

2. <u>"Reasonable Potential" Evaluation</u>

To determine if WQBELs are needed for individual pollutants, the EPA statistically compares applicable state water quality criteria to the maximum expected receiving water concentrations for a particular pollutant according to Chapter 3 of EPA's 1991 *Technical Support Document for Water Quality-based Toxics Control* (TSD). The maximum expected receiving water concentration is calculated based on dilution (if available and allowed by the State), the maximum reported effluent concentration, and a multiplier to account for uncertainty. ADEC has tentatively designated a mixing zone for Outfalls 001 and 005 (Chukchi Sea discharge only) for the protection of aquatic life. The mixing zone for fecal coliform represents a 50 m radius area. The mixing zone for metals represents an area 20 m wide x 25 m on either side of the diffuser. The multiplier generates a maximum expected effluent concentration from the maximum reported concentration, and decreases as the number of data points and variability of the data decreases. Variability is measured by the coefficient of variation (CV) of the data. When there are not enough data to reliably determine a CV, the TSD recommends using 0.6 as a default value. If the expected receiving water concentration exceeds the criteria, a WQBEL must be included in the permit (See B for calculations).

3. Permit Limit Derivation

Where the EPA has determined that there is "reasonable potential" to cause or contribute to an exceedance of the criteria, the Agency applies the statistical permit limit derivation approach described in Chapter 5 of the TSD to obtain the water quality-based permit limits (See Appendices C, D, and E). This approach takes into account effluent variability, sampling frequency, water quality standards, and the difference in time frames between the monthly average and daily maximum limits.

In order to develop WQBELs a waste load allocation (WLA) must first be determined. A WLA is the concentration (or loading) of a pollutant that may be discharged by a Permittee without exceeding water quality criteria in the receiving water. The Port Site draft permit considered the following options when determining WLAs.

a. Mixing Zone-based WLA

In situations where the receiving water quality meets State water quality standards, the State often authorizes mixing zones. Conversation and correspondence with the Alaska Department of Environmental Conservation (ADEC) provided the EPA with draft allowable mixing zones for fecal coliform and metals (cadmium, lead, zinc, copper, and mercury). Mixing zones allow for ambient concentrations above the criteria in small areas near the outfall(s) where initial dilution of a discharge takes place. The mixing zones do not impair the integrity of the water body as a whole, do not allow lethality to organisms passing through, and do not pose any serious health risks considering likely pathways of exposure. In the case of a state approved mixing zone, the WLA is calculated as a mass balance, based on the available dilution, background concentrations, and the State approved water quality criteria.

Because the different criteria (acute aquatic life, chronic aquatic life, human health) apply over different time frames and may have different mixing zones, it is not possible to compare them directly to determine which criterion results in the most stringent limits. For example, the acute criteria are applied as a one-hour average and may have a smaller mixing zone, while the chronic criteria are applied as a four-day average and may have a larger mixing zone. To allow for comparison, each criterion is statistically converted to a long-term average effluent concentration. This conversion is dependent upon the coefficient of variation (CV) of the effluent data and the probability basis used. The probability basis corresponds to the percentile of the estimated concentration. The EPA uses a 99th percentile for calculating a long-term average, as recommended in the TSD. Based

on this analysis, the criterion that results in the most stringent effluent concentration is the WLA that is used to calculate the permit limits.

b. "End-of-Pipe" WLA

In some cases, there is no dilution available for the effluent, either because the receiving water exceeds the criterion for the pollutant or because the State has not authorized a mixing zone for a particular pollutant. When there is no dilution, the State adopted criterion becomes the WLA.

4. Water Quality Criteria

Tables VI-1 and VI-2 list the parameters, and applicable saltwater and freshwater criteria adopted by the ADEC. The metals criteria are expressed in terms of total recoverable.

TABLE VI-1 Applicable Saltwater Quality Criteria

Parameter	Aquatic Acute	Aquatic Chronic
Cadmium (μg/L)	43.0	9.3
Lead (μg/L)	140.0	5.6
Zinc (μg/L)	95.0	58.0
Copper (μg/L)	2.9	4.0
Mercury (μg/L)	1.8	0.025
pH (s.u.)	6.5 -	8.5

TABLE VI-2 Applicable Freshwater Quality Criteria

Parameter	Aquatic Acute	Aquatic Chronic	Human Health
Cadmium (μg/L)	Hardness Dependent[1]		5.0
Lead (μg/L)	Hardness Dependent[1]		50.0
Zinc (μg/L)	Hardness Dependent[1]	47.0	Acute Aquatic Life (Hardness Dependent[1])

Copper (μg/L)	Hardness Dependent[1]			1000
Mercury (μg/L)	2.4		0.012	0.144
pH (s.u.)	6.5	-	8.5	N/A

1. Hardness dependent limits are calculated in Appendices C and E.

D. Effluent Limit Calculations

This section describes the technology-based effluent limits, WQBELs, and assumptions the EPA used to calculate the draft permit limits.

1. Outfall 001: Personnel Accommodations Complex and Temporary Construction Camp Sewage Treatment Plant and Desalination Plant Limitations

a. Biochemical Oxygen Demand and Total Suspended Solids

Alaska wastewater disposal regulation 18 AAC 72.029 requires secondary treatment of domestic wastewater unless a reduced treatment level is established by ADEC in response to a request by the applicant. Therefore, the draft permit contains EPA's secondary treatment effluent limitations described at 40 CFR 133.102 as BPJ (See Section VI.B.1.). The draft permit contains BOD_5 and TSS average monthly limits (AML) of 30 mg/L, and average weekly limits (AWL) of 45 mg/L. BOD_5 and TSS average monthly removal shall be greater than or equal to 85 percent. The 1986 Port Site permit contained the same AWL and AML for BOD_5 and TSS and a review of the facility's discharge monitoring reports (DMRs) indicate that these facilities have previously achieved compliance with these limits.

40 CFR 122.45(f) requires that NPDES permits contain mass-based limits for such pollutants as BOD_5 and TSS. The proposed loading limits are based on the design capacity of the two STPs. These limits were calculated by multiplying the concentration limits by the design flow (0.0288 mgd) and a conversion factor of 8.34 lb*L/mg*million gallons, as shown below:

Monthly Average Load:	= (0.0288 mgd)(30 mg/L)(8.34)
	= 7.2 lbs/day
Weekly Average Load	= (0.0288 mgd)(45 mg/L)(8.34)
	= 10.8 lbs/day

b. pH

According to 40 CFR 133.102, the technology-based pH limitation for secondary treatment facilities is from 6.0 to 9.0 standard units (s.u.). The Port Site's 1986 permit included this pH requirement. However, Alaska water quality standard (18 AAC 70.020(b)(2)) requires pH values to be within 6.5 to 8.5 s.u. for the protection of aquaculture water supply; growth and propagation of fish, shellfish, other aquatic life, and wildlife; and water recreation. Therefore the draft permit incorporates the state's more stringent requirement to remain within 6.5 - 8.5 s.u.

c. Fecal Coliform Bacteria

The fecal coliform (FC) limits in the draft permit are based on conversation and correspondence with the state permitting a 50 m radius mixing zone for fecal reduction in secondary treated effluent. Alaska Water Quality Standard (18 AAC 70.020(b)(2)) states that for harvesting and consumption of raw mollusks or other raw aquatic life that the FC median, most probable number (MPN) concentration may not exceed 14 FC/100 ml based on a 5-tube decimal dilution test. The Alaska Water Quality Standards for water supply aquaculture (not normally cooked) and seafood processing requires that, based on a minimum of five samples taken in a 30-day period, not more than 10% of the samples may exceed 40 FC/100 ml.

The 1986 Port Site NPDES permit did not include FC limits and the state and federal regulations do not include technology-based standards. Therefore, the draft permit incorporates limits of 400

FC/100 ml monthly average, 800 FC/100ml weekly average, and 1200 FC/100ml daily maximum as allowed by the state.

d. Floating, Suspended or Submerged Matter

The draft permit contains a narrative limit, consistent with State water quality standard 18 AAC 70.020(b)(2). This narrative limit requires that the Permittee not discharge floating solids, debris, sludge, foam, scum, or other residues which produce a film, sheen, or discoloration on the surface of the receiving water. Residuals also may not cause leaching of toxic or deleterious substances, or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines.

e. Summary of Outfall 001 limits

Table VI-3 summarizes the draft numerical permit limits for Outfall 001.

Table VI-3 Effluent Limitations for Outfall 001

Parameter	Daily Maximum	Weekly Average	Monthly Average
BOD_5 (mg/L)	---	45.0	30.0
(lbs/day)[1]		10.8	7.2
TSS (mg/L)	---	45.0	30.0
(lbs/day)[1]		10.8	7.2
pH (s.u.)	6.5 - 8.5	---	---
Fecal Coliform (#/100 ml)	1200	800	400

1 Percent removal requirements are as follows: for any month, the monthly average effluent load shall not exceed 15 percent of the monthly average influent load.

2. Outfall 005: Mine drainage (beyond concentrate storage buildings) Limitations

The draft permit contains both freshwater and marine water mine drainage effluent limits, allowing discharge to either the tundra or Chukchi Sea.

a. Zinc, Lead, Cadmium and pH

ADEC adopted acute and chronic water quality-based criteria for zinc, lead, and cadmium. The freshwater and saltwater criteria were presented in Tables VI-1 and VI-2, found in Section VI.4. The freshwater aquatic metals criteria (with the exception of chronic aquatic life for zinc) are dependent on hardness levels. Metals toxicity generally decreases as hardness increases, therefore, even moderate increases in hardness, typically measured as $CaCO_3$, can have significant effects on metals availability and associated aquatic water quality criteria. The EPA used a 313.2 mg/L hardness value to determine the aquatic criteria for freshwater (See C). EPA went through a reasonable potential determination to determine if water quality-based limits were needed (See B). WQBELs for cadmium, lead, and zinc were needed to protect a freshwater discharge to the tundra and WQBELs for lead and zinc were needed for a marine discharge to Chukchi Sea. The freshwater and marine criteria (except marine criteria for cadmium) were statistically applied to establish permit limits. The aquatic WQBELs (except marine cadmium) were compared to the technology-based and freshwater human health water quality limits, and found to be more stringent. Therefore, the aquatic WQBELs are included in Tables VI-4 and VI-5 as limits (See Appendices C and D for calculations). EPA then compared the technology-based limits for cadmium with the WQBELs. The technology-based cadmium limits for a Chukchi Sea discharge were found to be protective (See E).

Alaska's water quality standard (18 AAC 70.020(b)(1)) for freshwater pH is within 6.5 and 8.5 s.u. for the protection of aquaculture water supply, contact water recreation, and growth and propagation of fish, shellfish, and other aquatic life. Alaska's water quality standard (18 AAC 70.020(b)(2)) for saltwater pH is within 6.5 and 8.5 s.u. for the protection of aquaculture water supply; growth and propagation of fish, shellfish, other aquatic life, and wildlife; and water recreation. These WQBELs are more stringent than the technology-based requirement of from 6.0 - 9.0 (Section VI.B.2.) and are included as permit requirements in Tables VI-4 and VI-5.

b. Mercury, Copper, and Total Suspended Solids

Technology-based limits for mercury, copper, and TSS were presented in Section VI.B.2. The technology-based limits for mercury and copper were compared to WQBELs and found to be more protective except for a tundra mercury discharge (See E).

Technology-based limits are therefore included as permit requirements for a Chukchi Sea discharge and for a copper tundra discharge. WQBELs for a freshwater mercury discharge are also included as limits.

The water quality based effluent limits for a mercury tundra discharge fall below the level at which mercury can be accurately quantified using EPA analytical test methods. In such cases it is difficult to determine compliance with the effluent limits. The inability to measure to the necessary level of detection is addressed by establishing the Minimum Level[1] (ML) as the compliance evaluation level for use in reporting Discharge Monitoring Report (DMR) data. Effluent discharges at or below the ML would be considered in compliance with the WQBEL.

In the absence of promulgated MLs, Interim MLs should be used. EPA believes that Interim ML values can be derived most effectively as a multiple of the existing method detection limit (MDL) value for a given analyte. The Interim ML is calculated as 3.18 X the published MDL for the analyte for a specific analytical method approved under Section 304(h) or previously approved for use by the permitting authority (Draft National Guidance for the Permitting, Monitoring, and Enforcement of Water Quality-based Effluent Limitations Set Below Analytical Detection/Quantification Levels, March 1994).

Therefore, in addition to the water quality based effluent limits an interim minimum level will be incorporated into the permit. The interim minimum level for mercury is 0.6 µg/L. EPA will consider the permittee in compliance with the water quality based effluent limits for mercury provided the effluent does not exceed the interim minimum level.

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[1] Minimum Level - the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method-specified sample weights, volumes, and processing steps have been followed.

c. Floating, Suspended or Submerged Matter

The draft permit contains a narrative limit, consistent with State water quality standard 18 AAC 70.020(b)(2). This narrative limit requires that the Permittee not discharge floating solids, debris, sludge, foam, scum, or other residues which produce a film, sheen, or discoloration on the surface of the receiving water. Residuals also may not cause leaching of toxic or deleterious substances, or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines.

d. Summary of Outfall 005 Limits

The numeric effluent limits for outfall 005 have been developed for discharges to the tundra and Chukchi Sea, and are summarized in Tables VI-4 and VI-5.

TABLE VI-4 Tundra Effluent Limitations for Outfall 005

Parameter	Daily Maximum (hardness 313.2 mg/L)	Monthly Average (hardness 313.2 mg/L)
Zinc (μg/L)	77.1	38.4
Lead (μg/L)	22.5	11.2
Cadmium (μg/L)	4.6	2.3
pH (s.u.)	6.5 - 8.5	
Copper (μg/L)	300.0	150.0
Mercury (μg/L)	0.02	0.01
TSS (mg/L)	30.0	20.0

TABLE VI-5 Chukchi Sea Effluent Limitations for Outfall 005		
Parameter	Daily Maximum	Monthly Average
Zinc (μg/L)	1500.0	750.0
Lead (μg/L)	600.0	300.0
Cadmium (μg/L)	100.0	50.0
pH (s.u.)	6.5 - 8.5	
Copper (μg/L)	300.0	150.0
Mercury (μg/L)	2.0	1.0
TSS (mg/L)	30.0	20.0

E. Antidegradation

In proposing to issue this permit, the EPA has considered Alaska's antidegradation policy (18 AAC 70.015(a)). This provision states that the existing water uses and the level of water quality necessary to protect existing uses be maintained and protected. The provision also states that where the natural characteristics of the waterbody are higher than the water quality criteria, the existing quality must be maintained. Although data is not available to determine whether the receiving water is of higher quality than the water quality criteria, the limits proposed for this permit were evaluated and determined that they would not affect the existing water uses of the Chukchi Sea. Therefore, the permit is consistent with Alaska's antidegradation policy.

VII. BIOSOLIDS

A. General Authority for Biosolids Management

Section 405(f) of the CWA requires any NPDES discharge permit issued to a "treatment work treating domestic sewage" to include biosolids use and disposal requirements implementing the national standards and other requirements of the CWA. In addition, the sludge permitting regulations in 40 CFR 122 and 124 apply to all treatment works which either generate, treat, or dispose of domestic septage or sewage biosolids. As a treatment works treating domestic sewage, the STPs are considered "biosolids generators."

Pursuant to 40 CFR 122.41(a) and Section 405(e) of the CWA, a condition has been incorporated into the draft permit requiring the Permittee to comply with all existing federal and state laws, and all regulations applying to biosolids use and disposal. This includes future self-implementing standards under the CWA.

B. Biosolids Management

The Permittee transports biosolids (sewage sludge) created by the PAC, temporary construction camp, and mine Alaska Interstate Construction (AIC) camp STPs to either of the two Port Site co-incinerators for dewatering and co-incineration with municipal solid waste.

Limited information was provided on biosolids handling at the Port Site co-incinerators. The biosolids are transported from the STP's in closed containers to a sludge press to destroy pathogenic organisms and create a Class A biosolid. The biosolids are then co-incinerated by primary and secondary burners. The ash from the co-incinerators is disposed of in the Red Dog solid waste landfill. 40 CFR 503.6 states that requirements for disposal of biosolids by means of co-incineration are not covered by 40 CFR Part 503. However, compliance with the CWA and 40 CFR 122.21(d) must be assured.

C. Monitoring and Reporting

The draft permit requires monthly monitoring for the first year of the permit and quarterly monitoring thereafter. Monitoring shall be for biosolids for beryllium, mercury, arsenic, cadmium, chromium, lead, and nickel. These monitoring requirements are necessary to protect the public health under Section 405 of the CWA. These pollutants would be regulated if the biosolids were incinerated alone. Therefore, they are of interest whenever biosolids are incinerated. A major change in the biosolids metal content could create unacceptable emissions at the incinerator.

Facility biosolid records (and an annual report) containing information on the location of the facilities handling and receiving the biosolids, the quality of the biosolids, and amounts of biosolids being handled are necessary to demonstrate compliance with the permit and provide minimum information needed for inspections.

D. General Biosolids Requirements

To ensure compliance with the CWA, 40 CFR 122.21(d), and 40 CFR 503 at all times, the draft permit contains the following requirements.

1. Health & environment general requirement

The Permittee shall handle and use or dispose of the biosolids to ensure the protection of human health and the environment. The CWA requires that the environment and public health be protected from toxic effects of any pollutants in sludge.

2. Protection of surface waters from biosolid pollutants

Section 405(a) of the CWA specifically prohibits any practice where biosolids removed in a treatment works at one location would ultimately enter surface waters at another location without a specific permit. In this case, biosolids removed from sewage treatment plants other than the PAC, temporary construction camp, and AIC construction camp may not be incinerated under this permit.

3. Use/disposal contingency plan

According to the CWA, biosolids operations must comply with 40 CFR 503 and the effluent limits at all times, therefore the Permittee is required to address the possibility that the co-incinerators may not be able to accept biosolids for a period of time. Since treatment processes are dependent on mechanical systems, there is a potential for periods of breakdown, major repair, or maintenance. Also, Alaska communities have a potential for earthquakes which might damage the biosolid treatment or disposal system(s). The Permittee is considering the option of co-disposal in a landfill as their contingency plan. The contingency plan must be prepared and submitted to EPA for approval within 6 months of the effective date of the permit. The plan shall be implemented 6 months from the date of plan submission. EPA may amend the permit to authorize the backup sludge practice, such as co-disposal in a landfill.

4. Suspend delivery upon regulatory notice

The draft permit requires that delivery of biosolids be suspended if the co-incinerators have problems or issues that need to be corrected to prevent a potentially harmful environmental situation. In this case, the programs to permit and operate the co-incinerators may need to restrict the times, methods, equipment of delivery, and handling procedure, or require temporary storage or stockpiling or additional processing before incineration. The EPA may require the facilities to suspend delivery of biosolids upon a receipt of a written request from another regulatory agency or information that the incinerator is out of compliance with its air

pollution control permit. If this request or noncompliance information is received by either the biosolid generator or recipient, the Permittee must deliver a copy of the request or noncompliance information to the EPA within 48 hours.

5. Biosolid plan changes

Under the NPDES rules, the Permittee must apply for a major permit modification 180 days before making a major change in biosolids management (40 CFR 122.21). Disposal options other than co-incineration have not been approved as complying with the necessary state and federal standards, or for pre-treatment. Any other activity is considered a significant new biosolid activity and the procedures for a major permit modification must be followed. Major changes in biosolids management may be cause for modification, revocation, or reissuance of the permit.

VIII. MONITORING REQUIREMENTS

Under Section 308 of the CWA and 40 CFR 122.44(i), the EPA must include monitoring requirements in the permit whenever necessary to determine compliance with effluent limitations, assist in the development of effluent limitations, and assess the quality of receiving waters. Effluent and ambient monitoring may also be required to gather data for future effluent limitations or to monitor effluent impacts on receiving water quality. Monitoring frequencies are based on the nature and effect of the pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. The draft permit contains both effluent, ambient, and whole effluent toxicity monitoring requirements.

A. Quality Assurance Plan (QAP)

Under 40 CFR 122.41(e), the Permittee must properly operate and maintain all facilities which are used by the Permittee to achieve compliance with the conditions of the permit. This regulation also requires the Permittee to ensure adequate laboratory controls and appropriate quality assurance procedures. Quality assurance requirements apply to all permit required monitoring, including sample collection, handling, and shipment, on-site continuous and daily measurements, laboratory analysis, and data reporting and storage.

The Permittee shall amend the QAP, whenever there is a modification in the sample collection, the sample analysis, or any conditions/requirements that are not specified in the existing QAP.

B. Outfall 001: Monitoring of Sewage Treatment and Desalination Plants

To assure compliance with the effluent limitations set forth in the draft permit, the Permittee is required to monitor the discharges from Outfall 001 at the frequency specific in Table VIII-1. Effluent monitoring of salinity, cadmium, lead, and zinc are new requirements of the permit. The information from the cadmium, lead, and zinc monitoring will help determine whether or not limits should be established. Table VIII-1 presents the required monitoring parameters, frequencies, and sample types.

TABLE VIII-1. Monitoring Requirements for Outfall 001

Effluent Parameter[4]	Sampling Frequency	Sample Type
BOD_5 (mg/L)[1]	Weekly	24-hour Composite
Total Suspended Solids (mg/L)[1]	Weekly	24-hour Composite
Fecal Coliform (#/100 ml)	Weekly	Grab
Salinity (ppt)	Once in June, July, August, and September	Grab
Cadmium (μg/L)[2]	Once in June, July, August, and September	24-hour Composite
Lead (μg/L)[2]	Once in June, July, August, and September	24-hour Composite
Zinc (μg/L)[2]	Once in June, July, August, and September	24-hour Composite
Flow (mgd)	Continuous	Recorder
pH (s.u.)[3]	Daily	Grab

TABLE VIII-1. Monitoring Requirements for Outfall 001		
Effluent Parameter[4]	Sampling Frequency	Sample Type

Notes:

1. Percent Removal Monitoring: The percent BOD_5 and TSS removal will be reported on each monthly DMR form.
2. The Permittee shall conduct analysis for total recoverable metals.
3. The Permittee shall report the number of pH excursions outside the range of 6.5 to 8.5 standard units (s.u.) during the month.
4. If the discharge concentration falls below the MDL, the Permittee shall report the effluent concentration as "less than {numerical MDL}" on the DMR. Actual analytical results shall be reported on the DMR when the results are greater than the MDL. For averaging, samples below the MDL shall be assumed equal to zero. The Permittee shall report the number of non-detects for the month in the "Comment Section" of the DMR.

C. Outfall 005: Monitoring of Mine Drainage Beyond the Concentrate Storage Buildings

To assure compliance with the effluent limitations set forth in this permit, the Permittee is required to notify EPA on the monthly DMR of any changes in the location of outfall 005 and to monitor the discharge at the frequency specified in Table VIII-2 during discharge events. Table VIII-2 presents the required monitoring parameters, frequencies, and sample types.

TABLE VIII-2. Monitoring Requirements for Outfall 005		
Effluent Parameters[3]	Sampling Frequency	Sample Type
Hardness as $CaCO_3$ (μg/L)[4]	Once in June, July, August and September	Grab
Cadmium (μg/L)[1]	Weekly	24-hour Composite
Lead (μg/L)[1]	Weekly	24-hour Composite
Zinc (μg/L)[1]	Weekly	24-hour Composite
Copper (μg/L)[1]	Weekly	24-hour Composite
Mercury (μg/L)[1]	Weekly	24-hour Composite

Total Suspended Solids (mg/L)	Weekly	24-hour Composite
Flow (mgd)	Continuous	Recorder
pH (s.u.)[2]	Daily	Grab

Notes:

1 The Permittee shall conduct analysis for total recoverable metals.

2 The Permittee shall report the number of pH excursions outside the range of 6.5 to 8.5 standard units during the month.

3 If the discharge concentration falls below the MDL, the Permittee shall report the effluent concentration as "less than {numerical MDL}" on the DMR. Actual analytical results shall be reported on the DMR when the results are greater than the MDL. For averaging, samples below the MDL shall be assumed equal to zero. The Permittee shall report the number of non-detects for the month in the "Comment Section" of the DMR.

4 Hardness monitoring requirement applies only to a tundra discharge.

D. Minimum Detection Levels

Method Detection Levels (MDLs) are minimum levels that can be accurately detected by specific analytic test methods. However, rather than prescribe the specific test methods for cadmium, lead, zinc, and copper to be used that might monitor to unnecessarily low levels, the draft permit requires test methods that can measure to at least one-fifth of the states chronic criteria (the more stringent of saltwater or freshwater). In order to assess if the water quality is being impacted by the mercury in the storm drainage effluent, it is necessary to use the most accurate analytical methods. Table VIII-3 presents the detection levels for Outfalls 001 and 005. Adherence to this list will ensure consistency over the period of analysis.

Table VIII-3. Detection Levels	
Parameter	Detection Level
Cadmium (µg/L)	0.56
Lead (µg/L)	1.12
Zinc (µg/L)	9.4
Copper (µg/L)	0.8
Mercury (µg/L)	0.2

E. Whole Effluent Toxicity Testing

Whole effluent toxicity (WET) is the aggregate toxic effect of an effluent as measured directly by a toxicity test. Under 40 CFR 122.44(d)(1)(v), permits must contain limits on WET when a discharge has reasonable potential to cause or contribute to an exceedance of the water quality standard. In the case of the Port Site discharges, there is no data to evaluate "reasonable potential." Therefore, the draft permit requires WET testing to evaluate the toxic effects of the effluent on living organisms.

Alaska regulation 18 AAC 70.030, states that effluent may not impart chronic toxicity to aquatic organisms, expressed as 1.0 chronic toxic unit. Because of the deep outfall within the Chukchi Sea and available dilution, acute testing is more protective of the 1.0 chronic toxicity unit (TU_c) than chronic testing. This determination was based on calculations found in Chapters 1 and 5 of the TSD (See F for details).

Therefore, the draft permit requires completion of acute WET testing by the third year of the effective date of the permit. Testing (for that one year) during the months of June, July, August, and September shall be for acute toxicity. Monitoring and LC_{50} tests of fish populations and invertebrates, will occur using test samples at or before the point-of-discharge to the Chukchi Sea.

F. Ambient Monitoring Program

The draft permit requires the Permittee to conduct ambient water quality monitoring for salinity within the Chukchi Sea. Ambient water quality sampling for cadmium, lead, zinc, mercury, and copper is also required if the outfall 005 discharge is relocated from the tundra to the Chukchi Sea. Cadmium, lead, zinc, copper, and mercury ambient monitoring shall be for total recoverable metals. As discussed in Appendices D and E, the WQBELs were developed based on limited

cadmium, lead, and zinc monitoring in the Chukchi Sea. Background concentrations of mercury and copper were assumed to be zero within the Chukchi Sea due to a lack of monitoring data. The objective of ambient monitoring is to determine the background levels of cadmium, lead, zinc, copper, mercury, and salinity in the receiving water.

The draft permit requires the Permittee to submit a study plan for review and comment within 60 days of the effective date of the permit. The study plan must address the issues such as appropriate sampling location, temporal and spatial capability in the receiving water, appropriate sampling and analytical methods (including clean techniques, if necessary), analytical variability, and quality assurance/quality control for sampling and analysis. Upon submittal, the Permittee must implement the study within 30 days.

Based on the results of this study, the EPA can determine whether or not the permit limits need to be revised upon permit renewal. Table VIII-4 presents the ambient monitoring parameters and frequency.

TABLE VIII-4. Ambient Monitoring Requirements

Parameter	Monitoring Frequency
Cadmium (μg/L)	Once in June, July, August and September
Lead (μg/L)	Once in June, July, August and September
Zinc (μg/L)	Once in June, July August and September
Mercury (μg/L)	Once in June, July August and September
Copper (μg/L)	Once in June, July August and September
Salinity (ppt)	Once in June, July, August and September

IX. OTHER PERMIT CONDITIONS

A. Best Management Practices (BMPs)

Pursuant to Section 402(a) of the CWA, BMP plans may be included as conditions in NPDES permits. Section 402(a)(1) of the CWA allows the Administrator to prescribe conditions in a permit determined necessary to carry out the provisions of the CWA. BMPs are one such condition. Section 402(a)(2) authorizes the EPA to include miscellaneous requirements in permits on a case-by-case basis which are deemed necessary to carry out the provisions of the CWA. Based upon the aforementioned statutory authorities, the EPA promulgated regulations which provide for BMPs to be used "to control or abate the discharge of pollutants when numeric effluent limitations are infeasible" (40 CFR 122.44(k)(2) and (3)).

The Permittee must submit a BMP Plan to the EPA within six months of the effective date of the permit. The Plan will incorporate elements of pollution

prevention as set forth in the Pollution Prevention Act of 1990 (42 U.S.C. 13101) and is intended to achieve the following objectives: minimize the quantity of pollutants discharged from the facility, reduce the toxicity of discharges to the extent practicable, prevent the entry of pollutants into waste streams, and minimize mine drainage contamination. The Plan will include procedures for controlling spills during storage, transfer or loading activities; spill containment and clean up procedures; the prevention of substances other than the desalination brine (resulting from the reverse osmosis process) be discharged to outfall 001; and the optimization of chemical use.

Pursuant to 40 CFR 122.26, storm water runoff from the road is regulated by utilizing BMPs. The nature of the exposed materials along the road indicates the mine drainage discharges should not adversely affect water quality (assuming appropriate design and implementation of BMPs) therefore the draft permit does not require monitoring of individual culverts along the access road. The Permittee is required to conduct routine inspections and an annual comprehensive site evaluation to evaluate whether actions to reduce pollutant loadings to waters identified in the Plan are adequate and properly implemented.

The Plan shall be amended whenever there is a change in design, construction, operation, or maintenance which affects the potential for an increased discharge of pollutants to waters of the U.S. or if the Plan proves to be ineffective in achieving the general objectives of controlling pollutants in mine drainage discharges. If the road discharges are determined to be a significant source(s), the permit may be modified to include specific effluent limitations, additional monitoring requirements, and/or specific additions to the BMP Plan to reduce the pollutant discharge(s). The effectiveness of BMP's will be measured through regular inspections.

B. Unauthorized Discharges

In order to clarify Permittee responsibilities regarding the potential discharge of pollutants and/or waste streams not listed in the permit application, the permit expressly prohibits discharges of waste streams that are not part of the normal operation of the facility as disclosed in the permit application with the exception of the AIC mine camp biosolids.

C. Representative Sampling

The requirement in the federal regulations regarding representative sampling (40 CFR 122.41[j]) has been expanded and specifically requires sampling whenever a bypass, spill, or non-routine discharge of pollutants occurs, if the discharge may reasonably be expected to cause or contribute to a violation of an effluent limit under the permit. This provision is included in the draft permit because routine monitoring could easily miss permit violations and/or water quality standards exceedences that could result from bypasses, spills, or non-routine discharges. This requirement directs the Permittee to conduct additional, targeted monitoring to quantify the effects of these occurrences on the final effluent discharge.

D. Compliance Upon Permit Issuance

All permit limits will apply on the effective date of the permit.

X. OTHER LEGAL REQUIREMENTS

A. Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to request a consultation with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USF&WS) regarding potential effects an action may have on listed endangered species. In a letter dated November 18, 1997 the NMFS indicated that there were no endangered species likely to occur within the project area or the near shore waters of the Chukchi Sea. Offshore, the endangered bowhead whale and Steller or northern sea lion occur seasonally in the Chukchi Sea. In a letter dated November 3, 1997 the USF&WS identified the spectacled eider (Somateria fischeri) and the steller's eider (Polysticta stelleri) as threatened species in the areas of the discharge. In addition to these species, the USF&WS has listed the arctic peregrine falcon (Falco peregrinum tundrius) as a species of concern.

The spectacled eider and steller's eider migrate, in the spring and fall, through the Bering, Chukchi, and Beaufort seas and are sometimes observed along the coast. Post-breeding and young-of-the-year eiders may use coastal habitats near the Chukchi and Beaufort seas to feed and rest as they begin their migration back to the Bering Sea. However, the Port Site is not a designated critical habitat for spectacled eiders or Steller's eiders. Based on our interpretation, the EPA has determined that the discharges authorized by this permit will not affect the threatened species. The EPA will provide NMFS and USF&WS with copies of the draft permit and fact sheet during the public notice period. Any comments

received from these agencies regarding this determination will be considered prior to reissuance of this permit.

B. State Certification

Since state waters are involved in this permitting action, the provisions of Section 401 of the CWA apply. In accordance with 40 CFR 124.10(c)(1), public notice of the draft permit has been provided to the Alaska agencies having jurisdiction over fish, shellfish, and wildlife resources.

EPA has incorporated the mixing zones and fecal coliform effluent limits into the draft permit that were discussed prior to the certification process. The State will be asked to certify these mixing zones and fecal coliform limits used in calculating the effluent limitations in the draft permit. If certification of the mixing zones or fecal coliform limits are not provided, the limitations in the permit will be recalculated based on meeting water quality standards at the point of discharge. If certification of the mixing zones reflects a different level of dilution than that used to develop the draft permit limits, the limitations will be recalculated to reflect the certified information.

C. Coastal Zone Management Act (CZMA)

The state of Alaska will be reviewing this permit to determine consistency with the Coastal Zone Management Act.

D. Permit Term

The permit shall expire five years from the effective date.

A - PORT SITE MAP

APPENDIX B - OUTFALL 005 REASONABLE POTENTIAL DETERMINATIONS

A water quality-based effluent limit is necessary if the projected receiving water concentration (or technology-based limit concentration) exceeds the applicable water quality criteria. The following calculations determine whether limits for outfall 005 are necessary based on Chapter 3, of EPA's *Technical Support Document for Water Quality-Based Toxics Control*.

The projected maximum receiving water concentration (RWC) is calculated as follows:

RWC= $[C_e/\text{dilution}] + C_b$ where,

C_b	=	Background concentration of pollutant
C_e	=	Maximum projected effluent concentration
	=	Maximum effluent concentration * reasonable potential multiplier
dilution	=	ADEC has designated a mixing zone representing a 446:1 dilution for lead, cadmium, and zinc for a marine discharge only

Step 1 - Maximum projected effluent concentration

First the maximum effluent concentration was determined for zinc, cadmium and lead.

Zinc	=	9.5 mg/L
Cadmium	=	0.1 mg/L
Lead	=	2.5 mg/L

Then, the coefficients of variation (CV) were determined based on available monitoring information. A CV of 0.6 was assigned to the all of the pollutants due to a lack of sufficient data (< 10 data points):

Zinc	=	0.6
Cadmium	=	0.6
Lead	=	0.6

Calculate the reasonable potential multiplier, assuming 99% confidence level and 99% probability basis (using equations from Section 3.3.2 of the TSD):

RP multiplier = C_{99}/C_x where,

$\delta = \ln(CV^2 + 1) = 0.307_{zinc}, 0.307_{cadmium}, 0.307_{lead}$

$C_{99} = \exp(2.326\delta - 0.5\delta^2) = 1.95_{zinc}, 1.95_{cadmium}, 1.95_{lead}$

C_x = percentile represented by highest concentration in the data base

Solving for the RP multipliers and C_e's results in:

RP multipliers:		C_e's:	
Zinc=	3.2	Zinc=	30.4 mg/L
Cadmium=	3.6	Cadmium=	0.36 mg/L
Lead=	3.2	Lead=	8.0 mg/L

Step 2 - Determine the receiving water concentrations

Cominco supplied background receiving water concentrations (C_b) for lead and zinc in the Chukchi Sea. Cadmium was not detected by Cominco in the Chukchi Sea. Therefore, EPA assumed a background concentration of zero for cadmium due to the lack of available data or detection.

The RWC's are:

Zinc	=	[30.4/446] + 0.02333 = 0.0915 mg/L (marine discharge)
	=	[30.4/1] + 0.02333 = 30.4 mg/L (freshwater discharge)
Cadmium	=	[0.36/446] + 0 = 0.00081 mg/L (marine discharge)
	=	[0.36/1] + 0 = 0.36 mg/L (freshwater discharge)
Lead	=	[8.0/446] + 0.017 = 0.035 mg/L (marine discharge)
	=	[8.0/1] + 0.017 = 8.02 mg/L (freshwater discharge)

Step 3 - Determine the Reasonable Potential

If the RWC exceeds the most stringent applicable state water quality criteria, then there is reasonable potential for developing WQBELs. The following Table compares the RWC's with the water quality criteria (See section V.C.2) in units of mg/L.

Parameter	Max. projected RWC (saltwater/freshwater)	Most stringent water quality criteria (saltwater/freshwater)	Reasonable potential (saltwater/freshwater)
Zinc	0.0915/30.4	0.058/0.047	Yes/Yes
Cadmium	0.00081/0.36	0.0093/0.0028*	No/Yes
Lead	0.035/8.02	0.0056/0.0137*	Yes/Yes

* The freshwater criteria for cadmium and lead are hardness based. The more stringent chronic criteria were used, applying a hardness value of 313.2 mg/L:

cadmium = $e^{(.7852[\ln(\text{hardness})]-3.490)}$

lead = $e^{(1.266[\ln(\text{hardness})]-4.661)}$

APPENDIX C - DEVELOPMENT OF FRESHWATER CADMIUM, LEAD AND ZINC WATER QUALITY LIMITS FOR OUTFALL 005

Step 1 - Determine Applicable Criteria

The State water quality criteria for cadmium, lead and zinc (acute criteria only) are hardness dependent. EPA evaluated existing hardness data, provided by the Permittee, for the north lagoon because hardness data was not available for the tundra. To develop a conservative limit, EPA considered the 5th percentile hardness, 313.2 mg/L consistent with regional policy. The following water quality criteria have been adopted by the state:

	Acute	Chronic	Human Health
Cadmium	$a=e^{(1.128[\ln \text{hardness}] - 3.828)}$	$c=e^{(.7852[\ln(\text{hardness})]-3.490)}$	5.0 µg/L
Lead	$a=e^{(1.266[\ln(\text{hardness})]-1.416)}$	$c=e^{(1.266[\ln(\text{hardness})]-4.661)}$	50.0 µg/L
Zinc	$a=e^{(0.8473[\ln(\text{hardness})]+0.8604)}$	47 µg/L	307.9 µg/L

Step 2 - Determine Waste Load Allocations

The WLAs define the appropriate concentration of pollutant allowed in the effluent protective of aquatic life. A mixing zone cannot be established for the tundra and background levels are assumed to be zero due to a lack of monitoring data. Therefore, the WLAs are set equal to the criteria.

	Cadmium	Lead	Zinc
WLA_{acute}	14.2 µg/L	350.5 µg/L	307.9 µg/L
$WLA_{chronic}$	2.78 µg/L	13.7 µg/L	47 µg/L

Step 2 - Determine Long Term Averages

The acute and chronic WLAs are converted to Long Term Average concentrations (LTA_{acute} and $LTA_{chronic}$) using the following equations:

$LTA_{acute} = WLA_{acute} \times e^{[0.5\sigma^2 - z\sigma]}$ where,

CV = coefficient of variation of the effluent concentration, standard deviation/mean (see below for calculation) = $0.6_{cadmium}$, 0.6_{lead}, 0.6_{zinc}

σ^2 = $\ln(CV^2 + 1) = 0.307_{cadmium}$, 0.307_{lead}, 0.307_{zinc}

z = 2.326 for 99^{th} percentile probability basis

$LTA_{chronic} = WLA_{chronic} \times e^{[0.5\sigma^2 - z\sigma]}$ where,

CV = coefficient of variation of the effluent concentration, standard deviation/mean (see below for calculation) = $0.6_{cadmium,}$ 0.6_{lead}, 0.6_{zinc}

σ^2 = $\ln(CV^2/4 + 1) = 0.086_{cadmium}$, 0.086_{lead}, 0.086_{zinc}

z = 2.326 for 99th percentile probability basis

CV Calculation = EPA has used the CV default value of 0.6 for cadmium, lead and zinc because of a lack of sufficient monitoring data (*EPA Technical Support Document for Water Quality-based Toxics Control. 1991*).

	Cadmium	Lead	Zinc
LTA_{acute}	4.56 µg/L	112.5 µg/L	98.8 µg/L
$LTA_{chronic}$	1.47 µg/L	7.22 µg/L	24.8 µg/L

Step 3 - Calculate Maximum Daily and Average Monthly Limits

To protect a waterbody from both acute and chronic effects, the more limiting of the calculated LTA_{acute} and $LTA_{chronic}$ is used to derive the effluent limitations. The TSD recommends using the 95th percentile for the Average Monthly Limit (AML) and the 99th percentile for the Maximum Daily Limit (MDL).

To derive the MDL and the AML for cadmium, lead and zinc the calculations would be as follows:

MDL = $LTA_{chronic}$ X $e^{[z\sigma-0.5\sigma^2]}$ where,

CV = coefficient of variation = $0.6_{cadmium}$, 0.6_{lead}, 0.6_{zinc}

σ^2 = $\ln(CV^2 + 1) = 0.307_{cadmium}$, 0.307_{lead}, 0.307_{zinc}

z = 2.326 for 99th percentile probability basis

MDL = 4.57 µg/$L_{cadmium}$, 22.5 µg/L_{lead}, 77.1µg/L_{zinc}

AML = $LTA_{chronic}$ X $e^{[z\sigma- 0.5\sigma^2]}$ where,

CV = coefficient of variation = $0.6_{cadmium}$, 0.6_{lead}, 0.6_{zinc}

σ^2 = $\ln(CV^2/n + 1) = 0.086_{cadmium}$, 0.086_{lead}, 0.086_{zinc}

z = 1.645 for 95th percentile probability basis

n = number of sampling events required per month = 4

AML = 2.3 µg/$L_{cadmium}$, 11.2 µg/L_{lead}, 38.4 µg/L_{zinc}

Step 4 - Determine AML and MDL for Human Health

Chapter 5.4.4 of the TSD explains how to develop limits based on human health criteria. The TSD recommends setting the average monthly limit equal to the human health waste load allocation. The TSD also recommends calculating the maximum daily limit based on effluent variability, the number of samples taken per month, and a multiplier (found in Table 5.3).

Therefore,

AML = 5.0 µg/$L_{cadmium}$, 50.0 µg/L_{lead}, 5,000 µg/L_{zinc}

$\underline{\text{MDL}} = \underline{\exp [z_m\sigma - 0.5\sigma^2]}$

AML $\exp [z_a\sigma_n - 0.5\sigma_n^2]$ where,

CV = coefficient of variation = $0.6_{cadmium}$, 0.6_{lead}, 0.6_{zinc}

σ^2 = $\ln(CV^2 + 1) = 0.307_{cadmium}$, 0.307_{lead}, 0.307_{zinc}

σ_n^2 = $\ln(CV^2/n + 1) = 0.086_{cadmium}$, 0.086_{lead}, 0.086_{zinc}

n = number of sampling events required per month = 4

z_m = 2.326 for 99th percentile probability basis (MDL)

z_a =1.645 for the 95th percentile probability basis (AML)

MDL = 10.05 µg/$L_{cadmium}$, 100.5 µg/L_{lead}, 10,050 µg/L_{zinc}

<u>Step 5 - Compare Human Health, Aquatic Life, and Technology-based effluent limits</u>

Compare human health, water quality (aquatic life), and technology-based effluent limits and apply the more stringent limits. The following technology-based limits were listed in Section VI.B.2.

MDL = 100 µg/$L_{cadmium}$, 600 µg/L_{lead}, 1,500 µg/L_{zinc}

AML = 50 µg/$L_{cadmium}$, 300 µg/L_{lead}, 750 µg/L_{zinc}

Therefore, the water quality (aquatic life) effluent limits apply as follows:

MDL = 4.57 µg/$L_{cadmium}$, 22.5 µg/L_{lead}, 77.1 µg/L_{zinc}

AML = 2.3 µg/$L_{cadmium}$, 11.2 µg/L_{lead}, 38.4 µg/L_{zinc}

APPENDIX D - DEVELOPMENT OF SALTWATER LEAD AND ZINC WATER QUALITY-BASED LIMITS FOR OUTFALL 005

According to the reasonable potential determination for the Outfall 005 discharge, lead and zinc have the potential to exceed water quality standards outside of the approved mixing zone. Therefore, water quality-based effluent limits were calculated for lead and zinc. The calculations were performed according to proceedures in Chapter 5 of the TSD as outlined below.

Step 1- Determine Lead Wasteload Allocations (WLAs)

WLAs define the appropriate concentration of pollutant allowed in the effluent. The water quality criteria are converted to WLAs for the receiving water based on the following mass balance equation.

WLA = (Cr - Cb) * dilution

Cr = criteria that cannot be exceeded at the edge of the mixing zone

$Cr_{acute\text{-}lead}$ = 140 µg/L

$Cr_{chronic\text{-}lead}$ = 5.6 µg/L

$Cr_{acute\text{-}zinc}$ = 95 µg/L

$Cr_{chronic\text{-}zinc}$ = 58 µg/L

Cb_{lead} = background concentration = 17.0 µg/L

Cb_{zinc} = background concentration = 23.33 µg/L

dilution = mixing zone allowed by the State of Alaska = 446:1

$WLA_{acute\text{-}lead}$ = 54,858 µg/L

$WLA_{chronic\text{-}lead}$ = 2,498 µg/L

$WLA_{acute\text{-}zinc}$ = 31,965 µg/L

$WLA_{chronic\text{-}zinc}$ = 15,463 µg/L

Step 2 - Determine Long Term Averages

The acute and chronic WLAs are converted to Long Term Averages (LTA_{acute} and $LTA_{chronic}$) using the following equations:

$LTA_{acute} = WLA_{acute} \times e^{[0.5\sigma^2 - z\sigma]}$ where,

CV = coefficient of variation of the effluent concentration, standard deviation/mean (see below for calculation) = 0.6

$\sigma^2 = \ln(CV^2 + 1) = 0.307$

z = 2.326 for 99th percentile probability basis

$LTA_{acute\text{-}lead}$ = 17,609 µg/L

$LTA_{acute\text{-}zinc}$ = 10,261 µg/L

$LTA_{chronic} = WLA_{chronic} \times e^{[0.5\sigma^2 - z\sigma]}$ where,

CV = coefficient of variation of the effluent concentration, standard deviation/mean (see below for calculation) = 0.6

σ^2 = $\ln(CV^2/4 + 1) = 0.086$

z = 2.326 for 99th percentile probability basis

$LTA_{chronic\text{-}lead}$ = 1,316 µg/L

$LTA_{chronic\text{-}zinc}$ = 8,149 µg/L

CV Calculation = EPA has used the CV default value of 0.6 for lead and zinc because of a lack of sufficient monitoring data (*EPA Technical Support Document for Water Quality-based Toxics Control. 1991*).

Step 3- Determine Average Monthly and Maximum Daily Limits

To protect a waterbody from both acute and chronic effects, the more limiting of the calculated LTA_{acute} and $LTA_{chronic}$ is used to derive the effluent limitations. The TSD recommends using the 95th percentile for the Average Monthly Limit (AML) and the 99th percentile for the Maximum Daily Limit (MDL).

To derive the MDL and the AML for lead the following calculations were used:

$MDL = LTA_{chronic} \times e^{[z\sigma - 0.5\sigma^2]}$ where,

CV = coefficient of variation = 0.6

σ^2 = $\ln(CV^2 + 1) = 0.307$

z = 2.326 for 99th percentile probability basis

MDL_{lead} = 4,093 µg/L

MDL_{zinc} = 25,343 µg/L

$AML = LTA_{chronic} \times e^{[z\sigma - 0.5\sigma^2]}$ where,

CV = coefficient of variation = 0.6

σ^2 = $\ln(CV^2/n + 1) = 0.086$

z = 1.645 for 95th percentile probability basis

n = number of sampling events required per month = 4

AML_{lead} = 2,040 µg/L

AML_{zinc} = 12,631 µg/L

Step 4 - Compare Aquatic Life and Technology-based Effluent Limits

Compare water quality (aquatic life) and technology-based effluent limits and apply the more stringent limits. The following technology-based limits are more stringent (See Section VI.B.2.of the Fact Sheet)

MDL_{lead} = 600 µg/L AML_{lead} = 300 µg/L

MDL_{zinc} = 1,500 µg/L AML_{zinc} = 750 µg/L

APPENDIX E - DEVELOPMENT OF SALTWATER CADMIUM, COPPER, AND MERCURY LIMITS AND FRESHWATER COPPER AND MERCURY LIMITS FOR OUTFALL 005

Although the reasonable potential determination for cadmium (Appendix B) indicated that a water quality-based effluent limit is not necessary to protect marine water quality standards, it is also necessary to determine if the technology-based effluent limits violate water quality standards. It is also necessary to determine if the technology-based effluent limits for copper and mercury are protective of water quality standards in both freshwater and saltwater. The following calculations determine what the AML and MDL would be for a water quality-based limit and compares them to the technology-based limits.

Step 1- Determine Lead Wasteload Allocations (WLAs)

WLAs define the appropriate concentration of pollutant allowed in the effluent. The water quality criteria are converted to WLAs for the receiving water based on the following mass balance equation. Freshwater criteria for copper are based on a hardness of 313.2 mg/L

WLA = (Cr - Cb) * dilution

Cr = criteria that cannot be exceeded at the edge of the mixing zone

	Saltwater	Freshwater
$Cr_{acute-Cd}$	43.0 µg/L	N/A
$Cr_{chronic-Cd}$	9.3 µg/L	N/A
$Cr_{acute-Cu}$	2.9 µg/L	51,970 µg/L
$Cr_{chronic-Cu}$	4.0 µg/L	31,364 µg/L
$Cr_{acute-Hg}$	1.8 µg/L	2.4 µg/L
$Cr_{chronic-Hg}$	0.025 µg/L	0.012 µg/L

Cb = background concentration = 0 µg/L

dilution = Chukchi Sea mixing zone allowed by the State of Alaska = 446:1

dilution = 0 for a tundra discharge

	Saltwater	Freshwater
$WLA_{acute-Cd}$	19,178 µg/L	N/A
$WLA_{chronic-Cd}$	4,148 µg/L	N/A
$WLA_{acute-Cu}$	1,293 µg/L	51,970 µg/L
$WLA_{chronic-Cu}$	1,784 µg/L	31,364 µg/L
$WLA_{acute-Hg}$	803 µg/L	2.4 µg/L
$WLA_{chronic-Hg}$	11.2 µg/L	0.012 µg/L

Step 2 - Determine Long Term Averages

The acute and chronic WLAs are converted to Long Term Averages (LTA_{acute} and $LTA_{chronic}$) using the following equations:

$LTA_{acute} = WLA_{acute} \times e^{[0.5\sigma^2 - z\sigma]}$ where,

CV = coefficient of variation of the effluent concentration, standard deviation/mean (see below for calculation) = 0.6

$\sigma^2 = \ln(CV^2 + 1) = 0.307$

z = 2.326 for 99th percentile probability basis

	Saltwater	Freshwater
$LTA_{acute-Cd}$	6,156 µg/L	N/A
$LTA_{acute-Cu}$	415.5 µg/L	16,682 µg/L
$LTA_{acute-Hg}$	257.8 µg/L	0.7704 µg/L

$LTA_{chronic} = WLA_{chronic} \times e^{[0.5\sigma^2 - z\sigma]}$ where,

CV = coefficient of variation of the effluent concentration, standard deviation/mean (see below for calculation) = 0.6

$\sigma^2 = \ln(CV^2/4 + 1) = 0.086$

z = 2.326 for 99th percentile probability basis

	Saltwater	Freshwater
$LTA_{chronic-Cd}$	2,186 µg/L	N/A
$LTA_{chronic-Cu}$	940.2 µg/L	16,529 µg/L
$LTA_{chronic-Hg}$	5.9 µg/L	0.0063 µg/L

CV Calculation = EPA has used the CV default value of 0.6 for cadmium, copper and mercury because of a lack of sufficient monitoring data (*EPA Technical Support Document for Water Quality-based Toxics Control. 1991*).

Step 3- Determine Average Monthly and Maximum Daily Limits

To protect a waterbody from both acute and chronic effects, the more limiting of the calculated LTA_{acute} and $LTA_{chronic}$ is used to derive the effluent limitations. The TSD recommends using the 95th percentile for the Average Monthly Limit (AML) and the 99th percentile for the Maximum Daily Limit (MDL).

To derive the MDL and the AML for cadmium, copper, and mercury the following calculations were used:

$MDL = LTA_{chronic/acute} \times e^{[z\sigma - 0.5\sigma^2]}$ where,

CV = coefficient of variation = 0.6

σ^2 = $\ln(CV^2 + 1)$ = 0.307

z = 2.326 for 99^{th} percentile probability basis

	Saltwater	Freshwater
MDL_{Cd}	6,798 µg/L	N/A
MDL_{Cu}	1,293 µg/L	51,405 µg/L
MDL_{Hg}	18.35 µg/L	0.02 µg/L

$AML = LTA_{chronic/acute} \times e^{[z\sigma - 0.5\sigma^2]}$ where,

CV = coefficient of variation = 0.6

$\sigma^2 = \ln(CV^2/n + 1) = 0.086$

z = 1.645 for 95th percentile probability basis

n = number of sampling events required per month = 4

	Saltwater	Freshwater
AML_{Cd}	3,388 µg/L	N/A
AML_{Cu}	644.8 µg/L	25,620 µg/L
AML_{Hg}	9.2 µg/L	0.01 µg/L

Step 4 - Compare Aquatic Life and Technology-based Effluent Limits

Compare water quality (aquatic life) and technology-based effluent limits and apply the more stringent limits. The technology-based limits are presented below (also see Section VI.B.2.of the Fact Sheet). The technology-based limits are more stringent for copper (freshwater and saltwater), cadmium (saltwater), and mercury (saltwater only) and are thus included as permit limits. Because the mercury freshwater quality-based limits are more stringent than the technology-based limits they are required in the draft permit.

Techology-based limits

MDL_{Cd} = 100 µg/L

AML_{Cd} = 50 µg/L

MDL_{Cu} = 300 µg/L

AML_{Cu} = 150 µg/L

MDL_{Hg} = 2.0 µg/L

AML_{Hg} = 1.0 µg/L

APPENDIX F - WHOLE EFFLUENT TOXICITY

The following statistical permit limit derivation procedure provides a mechanism for determining which type of testing (acute or chronic) is more toxicologically protective. Alaska regulation 18 AAC 70.030 prohibits discharges that impart a chronic toxicity to aquatic organisms more than or equal to 1.0 chronic toxic unit (TU_c) at or beyond the mixing zone boundary.

Using chronic mixing zone (CCC) and an acute mixing zone (CMC) of:

CCC (chronic) dilution = 446:1

CMC (acute) dilution = 18:1

Step 1 (Section 1.3.1 of the TSD)

Calculate the chronic wasteload allocation (WLA_c):

WLA_c = (chronic criteria)(chronic dilution) = $(1.0TU_c)(446) = 446TU_c$

Step 2 (Section 4.5.5 of the TSD)

Calculate the acute wasteload allocation (WLA_a):

WLA_a = (CMC)(acute dilution) = $(0.3TU_a)(18) = 5.4TU_a$

Step 3

Convert the WLA_a to a wasteload allocation in terms of chronic criteria ($WLA_{a,c}$) by multiplying the WLA_a by an acute-to-chronic ratio (ACR). This ratio can be estimated as 10, based on information presented in Section 1.3.4 and Appendix A of the TSD.:

$WLA_{a,c} = (WLA_a)(ACR) = (5.4)(10) = 54.0TU_c$

Step 4

The $WLA_{a,c}$ and WLA_c are converted to Long Term Average concentrations ($LTA_{a,c}$ and LTA_c) using the following equations:

$LTA_{a,c} = WLA_{a,c} \times e^{[0.5\sigma^2 - z\sigma]}$ where,

$\sigma^2 = \ln(CV^2 + 1) = 0.307$

$z = 2.326$ for 99^{th} percentile probability basis

CV = coefficient of variation of the effluent concentration, standard deviation/mean (see below for calculation) = 0.6

$LTA_c = WLA_c \times e^{[0.5\sigma^2 - z\sigma]}$ where,

σ^2 = $\ln(CV^2/4 + 1) = 0.086$

z = 2.326 for 99th percentile probability basis

CV = coefficient of variation of the effluent concentration, standard deviation/mean (see below for calculation) = 0.6

CV Calculation = EPA has used the CV default value of 0.6 for whole effluent toxicity because of a lack of sufficient monitoring data (*EPA Technical Support Document for Water Quality-based Toxics Control. 1991*).

Using the equations, the $LTA_{a,c}$ and LTA_c are:

$LTA_{a,c}$ = 17.3

LTA_c = 235.0

Therefore, the acute testing appears more stringent than the chronic.